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FACSIMILE COVER SHEET

DATE: February 16, 2007
TO: MS AMENDMENT
EXAMINER: Matthew J. Song
GAU: 1722
FAX NO.: 571-273-8300
FROM: Jeffrey S. Abel
Reg. No. 36,079

U.S. APP NO.: 10/669,135

FILING DATE: September 23, 2003

APPLICANT(S): Milan Kokta

ATTY DKT NO.: 1035-BI4307

TITLE: SPINEL ARTICLES AND METHODS FOR FORMING SAME

NO. OF PAGES (INCL. COVER SHEET): 8

Attached please find:

- ☒ Transmittal Form (1 pg(s))
- ☒ Rule 132 Declaration (3 pg(s), unexecuted)
- ☒ Rule 132 Declaration (3 pg(s), executed)

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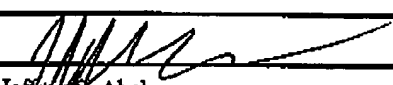
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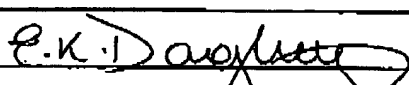
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|---|----------------------|------------------------|--|
| TRANSMITTAL FORM (to be used for all correspondence after initial filing) | Application Number | 10/669,135 | RECEIVED CENTRAL FAX CENTER FEB 16 2007 |
| | Filing Date | September 23, 2003 | |
| | First Named Inventor | Milan Kokta | |
| | Art Unit | 1722 | |
| | Examiner Name | Matthew J. Song | |
| Total Number of Pages in This Submission | 7 | Attorney Docket Number | 1035-BI4307 |

| ENCLOSURES (Check all that apply) | | |
|--|---|---|
| <input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53 | <input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation <input type="checkbox"/> Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD | <input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Rule 132 Declaration (3 pgs, unexecuted); Rule 132 Declaration (3 pgs, executed); |
| Remarks CUSTOMER NO.: 34456 | | |

| SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT | | | |
|--|---|----------|--------|
| Firm Name | LARSON NEWMAN ABEL POLANSKY & WHITE, LLP | | |
| Signature |  | | |
| Printed name | Jeffrey S. Abel | | |
| Date | 02/16/2007 | Reg. No. | 36,079 |

| CERTIFICATE OF TRANSMISSION/MAILING | | | |
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| I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below: | | | |
| Signature |  | | |
| Typed or printed name | Elise K. Dougherty | Date | 02/16/2007 |

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Milan Kokta, et al.

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Title: SPINEL ARTICLES AND METHODS FOR FORMING SAME FEB 16 2007

App. No.: 10/669,135

Filed: September 23, 2003

Examiner: Matthew J. Song

Group Art Unit: 1722

Customer No.: 34456

Confirmation No.: 2824

Atty. Dkt. No.: 1035-BI4307

MS AMENDMENT

Commissioner for Patents

PO Box 1450

Alexandria, VA 22313-1450

BEST AVAILABLE COPY**DECLARATION UNDER 37 C.F.R. §1.132**

I, Milan Kokta, hereby declare and state:

1. I am a co-inventor of the above-identified patent application.
2. I received my PhD in Engineering Science from the New Jersey Institute of Technology in 1972.
3. I have been engaged in the field of crystals, and in particular melt-based single crystal growth technologies, since 1972, including during my employment with Bell Labs (Murray Hill) from 1972 to 1973, Allied Chemicals (Materials Research Center) from 1973 to 1976, Union Carbide (Crystals Products) from 1977 to 1999, and Saint-Gobain (Crystals) from 1999 to 2007.
4. I have reviewed the Office Action dated July 24, 2006, as well as the prior art cited therein.
5. The claimed invention is drawn to a Czochralski method of forming single crystal spinel wafers from a melt. According to the invention, a spinel single crystal boule is grown from a melt, the boule having the general formula of $aAD \cdot bE_2D_3$, in which the ratio of b:a is

boule is formed at a process aspect ratio of not less than about 0.44. The process aspect ratio is defined as a ratio of average boule diameter to crucible inside diameter.

The claimed process aspect ratio in the context of the Czochralski method is responsible for quite significant properties of the boule. Namely, by growing the boule at a process aspect ratio not less than about 0.44, undesirable crystallographic "flipping" is prevented. In addition, multiphasic (crystallographic twinning, the boule having multiple crystal phases), is also prevented.

The forgoing beneficial effects of forming spinel boules at a high aspect ratio were discovered by me and my co-inventors *empirically*, the crystallographic effects not being predicted by any particular scientific theory or formulaic methodology. Indeed, we found the benefits of high process aspect ratio to be quite surprising, and today still remain unclear on the precise technical reasons why high process aspect ratio in the context of non-stoichiometric spinel crystal growth has been shown to have benefits mentioned above. In this regard, typically crystal growth scientists seek to minimize the mass of the growing crystal relative to the mass of the melt from which it is drawn. That is, by minimizing the mass of the growing boule relative to the melt, a large melt fraction is maintained in the crucible, which helps ensure homogeneous crystal growth and undesirable shifts in the stoichiometry of the melt. Minimizing the mass of the growing crystal relative to the melt dictates a low process aspect ratio. Accordingly, large size boules are generally achieved through scaling of the mass of the melt and crucible, not by increasing boule size relative to the mass of the melt and crucible. This simplistic approach, increasing boule size for a given melt/crucible, has been found in the art to deteriorate crystal quality.

I emphasize that not only does the prior art fail to recognize issues like crystallographic flipping and crystallographic twinning associated with Czochralski growth of spinel boules, but also fails to suggest utilizing a high aspect ratio to address those technical issues. Indeed, based upon my years of experience in the crystal growing field and experience of my colleagues including my co-inventors, I personally find the attendant benefits of utilizing a high process aspect ratio (not less than about 0.44) to be surprising and unexpected, and believe that one of

FEB. 16. 2007 4:42PM art v LNAPW 512-439-7199 NO. 0563 P. 5
...ant results to be unexpected. And further, based on
the prior art, which is silent on process aspect ratio, it would not have been obvious to one of
ordinary skill in the art to operate the described growth processes at a process aspect ratio not
less than 0.44.

6. I hereby declare that all statements made herein of my own knowledge are true and
that all statements made on information and belief are believed to be true; and further, that these
statements were made with the knowledge that willful false statements and the like, so made, are
punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false
statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Feb. 15, 2007
Date

Milan Kokta
Milan Kokta, PhD

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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4. I have reviewed the Office Action dated July 24, 2006, as well as the prior art cited therein.
5. The claimed invention is drawn to a Czochralski method of forming single crystal spinel wafers from a melt. According to the invention, a spinel single crystal boule is grown from a melt, the boule having the general formula of $aAD \cdot bE_2D_3$, in which the ratio of $b:a$ is greater than 1.5:1 such that the spinel is rich in E_2D_3 . Thereafter, the boule is sliced into wafers.

Of particular significance, the single crystal boule is formed at a process aspect ratio of not less than about 0.44. The process aspect ratio is defined as a ratio of average boule diameter to crucible inside diameter.

The claimed process aspect ratio in the context of the Czochralski method is responsible for quite significant properties of the boule. Namely, by growing the boule at a process aspect ratio not less than about 0.44, undesirable crystallographic "flipping" is prevented. In addition, multiphasic (crystallographic twinning, the boule having multiple crystal phases), is also prevented.

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ordinary skill in the art would find the attendant results to be unexpected. And further, based on the prior art, which is silent on process aspect ratio, it would not have been obvious to one of ordinary skill in the art to operate the described growth processes at a process aspect ratio not less than 0.44.

6. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like, so made, are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Date

Milan Kokta, PhD